

## INCIDENCE OF CERVICAL CANCER IN THE STATE OF PARAÍBA IN 2023 AND ITS CORRELATION WITH CYTOPATHOLOGICAL EXAMINATION

### INCIDÊNCIA DE CÂNCER DO COLO DO ÚTERO NO ESTADO DA PARAÍBA NO ANO DE 2023 E SUA CORRELAÇÃO COM O EXAME CITOPATOLÓGICO

### INCIDENCIA DE CÁNCER DE CUELLO UTERINO EN EL ESTADO DE PARAÍBA EN 2023 Y SU CORRELACIÓN CON EL EXAMEN CITOPATOLÓGICO



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#### ABSTRACT

Cervical cancer is caused by the Human Papillomavirus (HPV), although it is preventable through vaccination, especially serotypes 16 and 18, due to its virulence. This article aims to outline the epidemiological profile of cervical cancer in 2023 and its prospects. This is an exploratory, retrospective epidemiological study with a quantitative approach. The results were collected from data from INCA (National Cancer Institute), whose reports are issued biennially. A higher incidence was observed in the North and Northeast regions, with Paraíba accounting for 10.5% of cases and the Northeast 13.8% of cases. Cervical cancer detection is related to Pap smear or cytopathological testing, which should reach 100% of women aged 25 to 64, i.e., the most vulnerable population. The study resulted in a coverage rate of 83.23, and, because of its greater screening coverage, it has a lower cervical cancer mortality rate, since detection is linked to early treatment. It can be concluded that cervical cancer is a major public health problem; therefore, healthcare professionals should encourage patients to undergo this screening annually for early detection of HPV-related lesions and cancers.

**Keywords:** Cervical Cancer. Cytopathological. HPV. Women.

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## RESUMO

O câncer de colo de útero é causado pelo Papiloma Vírus Humano (HPV), apesar de prevenível por vacinação, sobretudo os sorotipos 16 e 18, em virtude de sua virulência. O presente artigo tem como objetivo delinear o perfil epidemiológico do câncer do colo do útero no ano de 2023 e suas perspectivas. Trata-se de um estudo exploratório, retrospectivo epidemiológico, numa abordagem quantitativa. Os resultados foram colhidos a partir dos dados do INCA (Instituto Nacional do Câncer), cujo os relatórios são emitidos bienalmente, observou-se uma maior incidência nas regiões norte e nordeste, onde a Paraíba representa 10,5 de prevalência de casos e o nordeste 13,85. A detecção do câncer do colo de útero está relacionada a realização do exame Papanicolau ou citopatológico, que deverá alcançar 100% das mulheres na faixa etária entre 25 a 64 anos, ou seja, a população mais vulnerável. A pesquisa resultou em uma cobertura de 83,23 e, por ter maior cobertura de exames, possui menor coeficiente de mortalidade de Câncer de colo de útero, uma vez que a detecção está relacionada ao tratamento precoce. Pode-se concluir que o câncer de colo do útero é um importante problema de saúde pública, portanto, os profissionais da rede de atenção à saúde devem motivar os pacientes a realização anual deste exame a fim de detecção precoce de lesões e cânceres relacionados ao vírus do HPV.

**Palavras-chave:** Câncer de Colo do Útero. Citopatológico. HPV. Mulheres.

## RESUMEN

El cáncer de cuello uterino es causado por el Virus del Papiloma Humano (VPH), aunque es prevenible mediante vacunación, especialmente los serotipos 16 y 18, debido a su virulencia. Este artículo tiene como objetivo describir el perfil epidemiológico del cáncer de cuello uterino en 2023 y sus perspectivas. Se trata de un estudio epidemiológico exploratorio y retrospectivo, con un enfoque cuantitativo. Los resultados se obtuvieron de datos del INCA (Instituto Nacional del Cáncer), cuyos informes se publican cada dos años. Se observó una mayor incidencia en las regiones Norte y Noreste, donde Paraíba representa una prevalencia del 10,5% de los casos y el Noreste del 13,85%. La detección del cáncer de cuello uterino está relacionada con la realización de la prueba de Papanicolaou o el examen citopatológico, que debería alcanzar al 100% de las mujeres de 25 a 64 años, es decir, la población más vulnerable. La investigación arrojó una cobertura del 83,23%, y debido a esta mayor cobertura de exámenes, se observa una menor tasa de mortalidad por cáncer de cuello uterino, ya que la detección está relacionada con el tratamiento precoz. Se puede concluir que el cáncer de cuello uterino es un problema de salud pública importante; por lo tanto, los profesionales de la salud deben alentar a las pacientes a someterse a este examen anualmente para la detección temprana de lesiones y cánceres relacionados con el virus del VPH.

**Palabras clave:** Cáncer de Cuello Uterino. Citopatología. VPH. Mujeres.

## 1 INTRODUCTION

Despite the advances obtained through prevention campaigns and the expansion of actions aimed at comprehensive women's health care within the scope of Primary Health Care (PHC), it is essential to highlight the institutional efforts undertaken to improve public policies aimed at combating cervical cancer in Brazil. In this context, several intersectoral meetings were held with the aim of discussing more effective strategies for prevention, early diagnosis, and management of the disease, culminating in the revision of SAS Ordinance No. 497, of 2016. This review reflected the need to strengthen multiprofessional integration in cervical cancer control actions, recognizing that the approach to this disease requires the articulated action of different health professionals, including physicians, nurses, community agents, psychologists and others in all stages of care.

Cervical cancer has as its main etiological agent the Human Papillomavirus (HPV), whose infection is considered one of the most common among sexually transmitted diseases. Among the numerous subtypes of the virus, serotypes 16 and 18 stand out for being the most oncogenic, being associated with most cases of invasive cervical neoplasms.

This study is justified by the epidemiological and social relevance of cervical cancer and the need to understand its dynamics in the regional context, especially in the state of Paraíba. The investigation aims to describe the incidence of registered cases of cervical cancer in 2023 and to establish its correlation with the coverage of cytopathological tests performed in the female population. Such an analysis is essential to assess the effectiveness of screening and prevention strategies, as well as to identify possible gaps in the supply of and access to primary health care services.

In view of the above, the following guiding question emerges: what is the incidence of cervical cancer cases in the state of Paraíba in the year 2023? This question becomes particularly relevant, considering the strategic role of epidemiological surveillance and Primary Health Care (PHC) in the early detection and control of neoplasms with the greatest impact on women's health. The present study aims to outline the incidence of cervical cancer cases in the state of Paraíba during the year 2023, establishing an updated panorama that enables the understanding of the distribution of the disease in the state territory. Based on this analysis, it is intended to support the decision-making process of health managers, providing qualified information that guides the planning of more effective actions directed to the real needs of the population.

The methodological approach adopted in this study is based on a retrospective epidemiological approach, focused on the analysis of data regarding the incidence of cervical cancer. This approach allows the observation and interpretation of previously recorded

information, enabling the identification of temporal patterns and trends relevant to disease monitoring. Data collection was carried out through consultations with the official databases of the José Alencar Gomes da Silva National Cancer Institute (INCA), a reference body of the Ministry of Health responsible for the consolidation and dissemination of epidemiological information on malignant neoplasms in Brazil. For this study, information from the biennial reports made available by INCA was used, thus configuring the use of secondary sources of data.

The introduction presents an in-depth contextualization of the investigated problem, emphasizing the scientific and social relevance of the theme, as well as the justification that underlies its choice. In this section, the general and specific objectives of the study are outlined, in addition to the exposition of the main methodological approaches and theoretical references that guide the analysis. In sequence, the theoretical foundation includes a critical review of the pertinent literature, addressing the central concepts, recent scientific evidence and epidemiological aspects related to the incidence, spatial distribution and factors associated with cervical cancer, with emphasis on the context of the state of Paraíba. This section aims to support the theoretical argumentation and situate the study in the field of current scientific knowledge. The section referring to methodological procedures describes in detail the study design, the data sources used, the criteria for selecting information and the analysis techniques used, ensuring transparency and reproducibility of the results obtained. Subsequently, the results and the discussion **are presented**, which bring together an interpretative and critical analysis of the data collected, enabling the identification of trends, patterns and implications for public health policies. This stage aims to establish a dialogue between the empirical findings and the existing scientific literature, contributing to the advancement of knowledge on the subject. Finally, the study concludes with the final considerations, which summarize the main conclusions, recognize the limitations of the research and indicate perspectives for future investigations. This section also highlights the practical and theoretical implications of the results, especially with regard to the improvement of cervical cancer prevention, control, and surveillance actions.

This article aims to improve strategies for preventing and reducing morbidity and mortality from cervical cancer, promoting the strengthening of surveillance, alert, and response related to this disease.

## 2 CONCEPTUAL THEORETICAL FRAMEWORK

Cervical cancer is one of the most relevant global public health problems, due to its high incidence and its social and economic impact, especially in low- and middle-income

countries. The World Health Organization (WHO) recognizes this disease as widely preventable through effective screening and immunization strategies against the Human Papillomavirus (HPV), its main etiological agent. In this sense, the WHO has set as a goal, within the framework of its Global Strategy for the Elimination of Cervical Cancer, the reduction of the incidence rate of the disease to less than 4 cases per 100,000 women per year worldwide, a milestone that, if achieved, will represent the elimination of cervical cancer as a public health problem (Boon et al, 2022).

In the Brazilian context, the scenario is still challenging. According to the José Alencar Gomes da Silva National Cancer Institute (INCA), it is estimated that approximately 17,000 new cases of cervical cancer will emerge per year in the period from 2023 to 2025, corresponding to an incidence rate of about 13.3 cases per 100,000 women. These numbers place this neoplasm among the most frequent types of cancer in the female population, especially in the North and Northeast regions, where there are greater inequalities in access to health services, lower HPV vaccination coverage, and low adherence to cytopathological screening (Brasil, 2024).

The persistence of high rates in the country reflects not only structural and organizational challenges of the health system, but also social determinants, such as conditions of vulnerability, low schooling, and limitations in access to information and prevention services. Thus, understanding the magnitude and distribution of cases is essential for planning public policies, allowing resources to be directed, expanding vaccination coverage, and strengthening screening and early diagnosis actions (Caminha et al, 2022).

Cervical cancer has as its main etiological agent the Human Papillomavirus (HPV), a virus of high prevalence worldwide, responsible for one of the most common sexually transmitted infections (STIs) among men and women. It is estimated that most sexually active individuals will be exposed to HPV at some point in their lives, although in most cases the infection is transient and spontaneously eliminated by the immune system. However, when the infection persists, especially by the subtypes of high oncogenic risk, there is a greater probability of developing precursor lesions and, eventually, cervical cancer. HPV serotypes 16 and 18 are recognized as the main responsible for cases of cervical neoplasia, being detected in about 70% of cervical cancers worldwide. Other genotypes, such as types 31, 33, 45, 52 and 58, also have oncogenic potential, although less frequently (Brasil, 2024).

Cervical cancer prevention can be carried out at different levels. Primary prevention involves vaccination against HPV, an effective and safe strategy, incorporated into the National Immunization Program (PNI) since 2014, with free offer for girls and boys aged 9 to

14 years. The vaccine confers protection against the main oncogenic serotypes and has proven to be essential to reduce the incidence of persistent infections and precursor lesions. In addition to immunization, the consistent use of condoms during sexual intercourse is a complementary measure that contributes to reducing the risk of transmission, although it does not completely eliminate the possibility of infection, given the contact between uncovered areas. Secondary prevention, on the other hand, involves **cytopathological screening (Pap smear)**, which allows the early detection of cervical cell changes before progression to invasive cancer. The periodicity and age range recommended by the Ministry of Health aim to balance the effectiveness of screening and the rational use of health resources (Glehn et al, 2023).

Cervical cancer ranks third among the most incident types of cancer in women in Brazil, surpassed only by breast cancer and colon and rectal cancers. This position highlights the epidemiological and social relevance of this neoplasm, which continues to represent an important challenge for the public health system, especially in regions with lower levels of socioeconomic development and limitations in access to preventive actions (Caminha et al, 2022).

Between 2012 and 2023, a trend of reduction in the incidence and mortality from cervical cancer was observed in the country, reflecting more effective public policies aimed at cytopathological screening and the implementation of vaccination against the Human Papillomavirus (HPV). However, in parallel with this reduction, there was a significant increase, about 46%, in the number of women who underwent outpatient procedures related to the disease within the scope of the Unified Health System (SUS) (Brasil, 2024).

In 2022, outpatient procedures associated with lesions resulting from HPV infection reached approximately 50,000 records, while at the hospital level, approximately 19,000 visits related to the same etiology were recorded. These numbers demonstrate not only the magnitude of the clinical impact of HPV, but also the growing demand for specialized services in the SUS, both for the diagnosis and treatment of intraepithelial lesions and for the management of more advanced cases of cervical neoplasia (Caminha et al, 2022).

The increase in the number of procedures performed can be interpreted from two complementary perspectives: on the one hand, it reflects the advance of screening and surveillance policies, with earlier detection of precursor lesions; on the other hand, it evidences the persistence of regional and socioeconomic inequalities which hinder women's regular access to preventive actions, contributing to the maintenance of a significant contingent of cases diagnosed in more advanced stages (Farrara et al, 2022).

Cervical cancer control actions in Brazil follow standardized protocols, since the high morbidity and mortality rates associated with the disease require organized and effective coping strategies. The need to standardize screening, diagnosis, and treatment practices has led to the formulation of specific and nationwide public policies (Oliveira et al, 2022).

The first structured initiative took place between 1972 and 1975, with the National Cancer Control Program, implemented by the Ministry of Health, which represented a milestone in the organization of actions aimed at prevention and early detection. Subsequently, in 1998, the National Cervical Cancer Control Program, known as the Viva Mulher Program, was instituted, which significantly expanded access to Pap smears and strengthened health education actions aimed at the female population (Brasil, 2024).

In 2011, the Brazilian Guidelines for Cervical Cancer Screening were published, a reference document that systematizes technical recommendations on the priority age group, frequency of exams and conducts in the face of altered results. These guidelines were updated in 2016, based on recent scientific evidence, incorporating advances such as the use of HPV detection testing and integrated surveillance and monitoring strategies (Brasil, 2024).

The organization of integrated actions aimed at the control of cervical cancer, combined with the intensification of activities in Primary Health Care (PHC), considered the main gateway to the Unified Health System (SUS), has proven to be fundamental for the early detection of precursor lesions and for the adequate and timely referral of patients. Through articulated action between professionals from different areas, the implementation of standardized protocols, and the expansion of the coverage of Pap smears, it becomes possible to identify cervical changes in the early stages, significantly increasing the chances of effective treatment and reduction of complications (Ferrara et al, 2022).

However, despite the advances achieved in prevention, screening, and treatment strategies, cervical cancer remains one of the main causes of female morbidity and mortality in Brazil, especially in populations with less access to health services or in regions characterized by socioeconomic inequalities. This scenario shows that, although public policies have promoted improvements in care, structural, organizational, and social challenges persist that limit the full effectiveness of disease control actions (Jardim et al, 2022).

In Brazil, there has been a stationary trend in the mortality coefficient for cervical cancer since 2014, a phenomenon that may be related to demographic and epidemiological factors, such as population aging and the epidemiological and demographic transition. characterized by the increased prevalence of chronic and degenerative diseases replacing

traditional infectious causes. This scenario highlights the complexity of disease control, which involves not only direct health interventions, but also interaction with broader social and structural processes (Madeiro et al, 2022).

It is important to highlight that significant regional disparities persist, both in the coverage of the Pap smear test and in the incidence and mortality coefficients. Such inequalities are closely linked to factors such as access to health services, implementation and effectiveness of public policies for prevention and screening, as well as social determinants, including schooling, income, housing conditions, and geographic location. These elements can directly influence early detection, appropriate referral, and timely treatment of patients, affecting the effectiveness of disease control actions (Maira et al, 2022).

In 2025, the RT-PCR test for the detection of Human Papillomavirus (HPV) DNA was implemented, considered a more sensitive and effective tool in the identification of high-risk infections, compared to traditional cytopathological screening methods. The test was proposed to be performed every five years, presenting not only greater diagnostic accuracy, but also lower operational costs, which favors its large-scale adoption within the scope of the Unified Health System (SUS). The expectation is that, in the medium and long term, RT-PCR will progressively replace the cytopathological test, consolidating itself as the main method of cervical cancer screening. This initiative reduces the achievement of the diagnosis from 25 to 5 days after the test is performed (Pathah et al, 2022).

The preparation of the technical guidelines for the implementation of the test was coordinated by the José Alencar Gomes da Silva National Cancer Institute (INCA) and had the participation of 81 specialists representing five secretariats of the Ministry of Health, as well as the Pan American Health Organization (PAHO). In addition, 37 institutions from all regions of the country, including universities, reference hospitals, specialized medical societies, and civil society organizations, contributed with technical knowledge, scientific evidence, and practical recommendations to ensure the feasibility and effectiveness of the strategy (WHO, 2024).

### **3 MATERIAL AND METHOD**

This is a retrospective, exploratory and cross-sectional study, with a quantitative approach. The objective is to evaluate the incidence of cervical cancer in the state of Paraíba, in 2023, and to analyze its correlation with the coverage of cytopathological tests performed in the same period. The investigation focused on new cases of cervical cancer registered by the National Cancer Institute (INCA), considering that this neoplasm represents a relevant

public health problem, due to its high morbidity and mortality among women (Timoteo et al, 2020).

The data used in this study were obtained from the National Cancer Institute (INCA), the agency responsible for registering and monitoring cervical cancer cases in Brazil, including those referring to the year 2023. INCA publishes biennial reports on cancer registries, constituting an essential source for the evaluation of morbidity and mortality and its trends over time. In addition, it plays a strategic role by providing a centralized platform for the collection, storage, and analysis of epidemiological information related to this neoplasm, contributing to the planning and implementation of public policies aimed at cancer prevention and control (INCA, 2023).

The choice of the National Cancer Institute (INCA) as a data source is justified by its comprehensiveness, reliability, and national and international recognition in epidemiological investigations. The system provides a comprehensive and detailed set of information on cancer cases registered throughout the country, including patient demographic data, clinical and histopathological characteristics of tumors, types of treatment instituted, and respective clinical outcomes (Brasil, 2023).

Thus, the data from the National Cancer Institute (INCA) constitute a solid and comprehensive basis for the analysis of the epidemiological profile of cancer in the period under study. This information enables an in-depth understanding of morbidity patterns and epidemiological trends related to the disease, both in the context of the state of Paraíba and at the national level, supporting the planning and evaluation of actions aimed at the prevention, early diagnosis, and control of cervical cancer (Timoteo et al, 2020).

After the collection stage, the data were organized, treated and later used to calculate the incidence of cervical cancer. The estimate of this incidence was based on official information provided by the National Cancer Institute (INCA), constituting a robust methodological basis for the presentation, interpretation, and discussion of the results. This procedure enabled a thorough analysis of the frequency and spatial distribution of cases registered in the state of Paraíba during the year 2023, contributing significantly to the understanding of the profile and epidemiological behavior of the disease in the period investigated (Roquayrol, 2018).

The data below were obtained from the incidence equation:

**Incidence = Number of new cases of the disease/total population at risk x1000.**

The calculation of incidence is a fundamental statistical method to measure the proportion of individuals in a given population who develop a specific condition in a defined period. It is an essential epidemiological measure for understanding the dynamics of disease

occurrence, allowing the evaluation of the behavior and magnitude of a disease in the context of public health. Estimating the incidence is, therefore, an indispensable instrument to support the formulation of public policies, the planning of health services, and the evaluation of the effectiveness of the interventions implemented (Roquayrol, 2018).

#### 4 RESULTS

Data collection was carried out based on information made available by the National Cancer Institute (INCA), referring to the year 2023, with a specific focus on the incidence of cervical cancer. These data were carefully extracted and organized in a table, in order to enable a more accurate statistical analysis. After the tabulation stage, the equation previously described was applied to calculate the incidence of cases in the study period. It is important to emphasize that, as it is a secondary data source, the study has some limitations, such as the impossibility of accessing the exact number of registered cases. However, these data allow us to outline the epidemiological profile of the disease, contributing to the evaluation of control and prevention actions aimed at cervical cancer. (INCA, 2023).

This statistical analysis process made it possible to obtain detailed insights into the incidence of cervical cancer in the state of Paraíba in 2023. From the tabulated data, three graphs were prepared that illustrate, in a clear and objective way, the main trends and patterns identified. These visual instruments are essential for understanding variations in the incidence of the disease, allowing the assessment of the trend of cases over the analyzed period, as well as supporting the identification of possible risk factors and the definition of more appropriate control and prevention measures (Sing et al, 2022).

In the context of public health, these results play a fundamental role in the design of intervention and control strategies, especially aimed at the regions and population groups most vulnerable to the disease. The graphical representation of data, in this sense, not only facilitates the interpretation and analysis of results, but also constitutes an effective tool for communicating scientific evidence to health professionals, managers, and public policy makers, favoring more assertive and evidence-based decision-making (Vale et al, 2021).

The following tables present the detailed results obtained from the incidence equations, enabling an accurate analysis of both the occurrence of cervical cancer cases and the profile of the cytopathological tests performed. It is important to highlight that this neoplasm represents a relevant public health problem, being responsible for high morbidity and mortality rates among women. On the other hand, it is a condition that can be largely prevented, as long as effective screening actions, health education, and expanded access

to primary care services are implemented, benefiting the female population in an equitable way (Santos et al, 2023).

The human papillomavirus (HPV) is recognized as the etiological agent responsible for approximately 99% of cervical cancer cases. The Pap smear, widely used in the public health system, stands out for being a simple, low-cost and effective procedure in the early detection of precursor lesions. The implementation and expansion of this test in primary care, aimed at the target population, have contributed significantly to the reduction of the number of advanced cases, representing an important advance in tackling this relevant public health problem (Brasil, 2022).

Cervical cancer screening represents a key strategy for reducing mortality and can effectively save lives. In this context, the commitment of health professionals and public managers is essential to strengthen disease prevention and control actions. Considering that the evolution of cervical cancer occurs slowly and gradually, there is a wide window of opportunity for effective interventions, both in the political sphere, through the formulation and implementation of public policies, and in the care sphere, through the early detection and timely treatment of precursor lesions (Oliveira et al, 2022).

The strengthening of the health care network is an essential element for reducing the incidence and mortality rates for cervical cancer, by promoting comprehensive, continuous and equitable care for women. This consolidation of the network involves the articulation between the different levels of primary, secondary and tertiary care, ensuring timely access to screening, diagnosis, treatment and rehabilitation services. In addition, the improvement of the technical capacity of the teams, the investment in the continuing education of professionals, and the expansion of health surveillance actions are fundamental strategies to ensure the effectiveness of public policies and compliance with the principles of the Unified Health System (SUS), especially those of universality, equity, and comprehensiveness of care (Jardim et al, 2022).

Brazil has intermediate incidence and mortality rates for cervical cancer (CC) compared to other countries, but with marked regional and interstate inequalities. It is observed that the North and Northeast regions concentrate the highest rates of the disease, while the South and Southeast have significantly lower values. This disparity may be directly related to the social determinants of health, since territories with a lower Human Development Index (HDI) tend to have more precarious conditions of access to health services, lower coverage of Pap smear screening, deficiencies in sanitary infrastructure, and educational and socioeconomic inequalities (Meira et al, 2022).

Table 1 presents the distribution of cervical cancer (CC) incidence in the states of the Northeast region during the year 2023, considering both the absolute number of cases and the inference-adjusted values, calculated using the SPSS software. The first column of the graph represents the total number of cases recorded for the year, providing an overview of the volume of new diagnoses. The second column shows the adjusted values after the application of the prevalence equation, allowing a more refined estimate of the incidence. The joint analysis of this information offers a comprehensive understanding of the epidemiological situation, making it possible to identify trends, patterns, and potential regional disparities in CC cases over the study period.

When analyzing the table presented, it can be seen that the state of Paraíba recorded the lowest incidence of cervical cancer cases among the states in the Northeast region in 2023. This result suggests that the prevention, tracking and coping actions of the disease implemented in the state have obtained positive effects. Such measures include expanding the coverage of Pap smears, health education aimed at the female population, awareness campaigns on risk factors, and vaccination against HPV (Brasil, 2023).

**Table 1**

*Distribution of CC incidence in the northeastern states*

Northeast	Cases	Detection tee	Incidence
Alagoas	370	20,91	18,54
Bahia	1.160	14,93	11,84
Ceará	1.030	21,49	13,97
Maranhão	800	21,71	21,13
Paraíba	290	13,42	10,5
Pernambuco	770	15,18	12,14
Piauí	360	21,19	15,23
Rio Grande do Norte	280	15,33	12,06
Sergipe	220	17,71	13,85

Source: Ministry of Health

Table 2 shows the percentage of Pap smears performed annually in the states of the Northeast region. When analyzing the data, a trend of progressive increase in the coverage of these tests is observed over the period studied. This growth may be related to different factors, among which the financial incentive promoted by the federal government, the strengthening of public health policies, and the adequate financing of procedures, which enable the expansion of access to screening services (INCA, 2023).

In addition, the expansion of the coverage of the Pap smear test reflects the effort of the state and municipal health networks to implement actions for the prevention and early detection of cervical cancer. The increase in the performance of these tests is a positive

indication that more women are being monitored, enabling the early identification of precursor lesions and, consequently, the reduction of incidence and mortality from the disease. Thus, the analysis of these data is essential to evaluate the effectiveness of screening strategies, identify regional gaps, and support the formulation of more equitable and effective public policies. See table 2.

**Table 2**

*Percentage of tests performed per year in the northeastern states*

STATES	2018	2019	2020	2021	2022
ALAGOAS	78,51	79,45	80,64	81,69	83,56
BAHIA	78,81	79,35	80,9	81,62	82,48
CEARÁ	79,35	78,97	80,83	82,35	83,5
MARANHÃO	77,67	78,24	79,94	81,31	82,14
PARAÍBA	78,79	79,59	81,06	82,12	83,23
PERNAMBUCO	78,8	79,25	80,56	80,94	81,43
PIAUI	80,95	80,67	81,97	84,35	85,26
RIO GRANDE DO NORTE	79,02	79,46	80,64	81,8	82,4
SERGIPE	76,03	77,16	79,35	80,53	81,54

Source: Ministry of Health

When analyzing the graph presented, it was observed that the state of Paraíba stands out as the third state with the highest percentage of coverage of cytopathological tests in the region. At the same time, it was recorded that Paraíba has one of the lowest incidences of cervical cancer (CC) among the states analyzed. This relationship suggests a possible correlation between the wide coverage of the tests and the reduction in the incidence of the disease, indicating that the effectiveness of screening and prevention strategies may have contributed to the early detection of precursor lesions of CC and, consequently, to the reduction in the occurrence of advanced cases (Brasil, 2024).

In addition, the high coverage of Pap smears shows the positive impact of public health policies aimed at preventing CC, reinforcing the importance of maintaining and expanding these actions in the state. Such data can serve as a reference for comparative analysis with other states in the region, enabling the identification of good practices and the improvement of strategies to control and cope with this neoplasm.

The state of Maranhão had the highest incidence of cervical cancer (CC) among the states analyzed, despite having registered a coverage of cytopathological tests above 80%. This data indicates that, although early detection through screening is widely performed, other factors may be influencing the high occurrence of the disease. Among these factors, social determinants stand out, which include socioeconomic conditions, limited access to quality health services, educational inequalities, geographic and cultural barriers, as well as lifestyle habits and behavioral factors of the population.

This situation shows that the coverage of tests, although essential, is not sufficient in isolation to reduce the incidence of cervical cancer. It is necessary to consider integrated strategies that combine effective screening with public policies that act on the social determinants of health, promoting health education, population awareness, and improvements in access to and quality of cancer care. Thus, the analysis suggests that coping with cervical cancer requires a multifactorial approach, which goes beyond the simple performance of tests, contemplating preventive, educational and structural actions to effectively reduce the incidence of the disease.

## 5 DISCUSSION

The high morbidity and mortality rate for cervical cancer (CC) remains an important indicator of public health, being associated with several behavioral and biological risk factors, such as early initiation of sexual life, multiplicity of sexual partners, smoking, low parity, persistent infections by the HPV virus and unfavorable socioeconomic conditions. These elements contribute to the increased vulnerability of the female population to the development of the disease and to the progression of precursor lesions when there is no early detection (Pathah et al, 2022).

However, it is observed that, with the advancement of public health policies aimed at the prevention and screening of CC, such as the expansion of the coverage of Pap smears, the implementation of HPV vaccination programs, and educational campaigns on sexual and reproductive health, morbidity and mortality rates have shown a downward trend. This decrease highlights the effectiveness of integrated prevention and control strategies, reinforcing the importance of continuous investments in health promotion actions, education, and access to quality services, which act in an articulated way on risk factors and social determinants of the disease (Jardim et al et al, 2022).

Table 1 shows that the state of Paraíba had one of the lowest incidence rates of cervical cancer (CC) compared to the other states in the Northeast region, while Maranhão recorded the highest rate among the states analyzed. This discrepancy, even among geographically close states, suggests that several factors can influence the occurrence of the disease, including the management of public health policies, the Human Development Index (HDI), as well as other social and economic determinants, such as access to health services, education, income conditions, and sanitary infrastructure (Boon et al, 2022).

Despite these regional differences, it is possible to observe a positive trend in all states in the region: coverage in the performance of Pap smears increased throughout the time series analyzed, comprising the years 2018 to 2022. This increase reflects the impact of CC

screening and prevention policies, evidencing continuous efforts to expand access to early detection and reduce morbidity and mortality associated with the disease (Wirtz et al, 2022).

The joint analysis of these data reinforces the importance of considering both the effectiveness of screening strategies and social determinants in the formulation of public policies. While the increase in test coverage contributes to the reduction of risk and mortality from CC, the differences observed between the states indicate that complementary measures, aimed at social equity and the improvement of living conditions, are essential for the full effectiveness of preventive health actions (Madeiro et al, 2022).

The differences in the incidence of cervical cancer (CC) between the states are strongly related to social determinants, and it is observed that regions with lower Human Development Index (HDI) tend to have a higher incidence of the disease. This shows that socioeconomic, educational, and access to health services inequalities play a central role in women's vulnerability to CC (Ferrara et al, 2022).

It is observed that the largest number of cases is concentrated in the municipality of João Pessoa and its metropolitan region, which may be directly related to the higher population density of these areas. More populous municipalities tend to have a higher absolute number of cases, both because of the population's greater exposure to risk factors and because of the greater installed capacity of health services, which favors the detection, registration and notification of diseases. In addition, the centralization of referral services in the capital may contribute to the concentration of records, since individuals from other municipalities often seek care in these places (SES/PB, 2024).

In addition, individual factors, such as gender, age group, education level, income, lifestyle habits, and conditions of access to health services, directly influence the probability of late diagnosis, which is one of the main challenges for effective control of the disease. Diagnosis in advanced stages is associated with worse clinical outcomes and higher morbidity and mortality, reinforcing the need for strategic preventive actions (Madeiro et al, 2022).

Thus, making the population aware of the importance of regular Pap smears and the adoption of preventive measures becomes paramount. Educational campaigns, community health programs, and strategies to promote sexual and reproductive health can contribute significantly to early detection, reducing the number of late diagnoses and, consequently, the incidence and mortality associated with CC (Caminha et al, 2022).

The study was carried out with the objective of analyzing the factors associated with late diagnosis of cervical cancer (CC) from the hospital records of women aged between 18 and 99 years, in the period from 2006 to 2015, obtained through the Integrator of Hospital

Cancer Records. To complement the analysis, contextual variables related to socioeconomic aspects and health infrastructure were collected from the Atlas of Human Development, the National Registry of Health Establishments (CNES), and the Outpatient Information System (SIA) (Brasil, 2024).

The results indicated that the prevalence of diagnosis at an advanced stage was 48.4%. Significant associations were identified with several individual and contextual factors. Among the individual factors, older age stood out (PR 1.06; CI 1.01–1.10), black, brown, and indigenous race/skin color (PR 1.04; CI 1.01–1.07), lower levels of education (PR 1.28; CI 1.16–1.40) and absence of a marital partner (PR 1.10; CI 1.07–1.13). Among the factors related to access to and use of health services, referral by public route (PR 1.07; CI 1.03–1.11) and the lowest rate of Pap smears (PR 1.08; CI 1.01–1.14) were also significantly associated with late diagnosis (INCA, 2023).

These findings indicate that diagnosis in advanced stages of CC is related both to individual factors, such as age, education, race, and marital status, and to contextual determinants linked to access to and quality of health services. The identification of these factors reinforces the need for integrated prevention and screening strategies, especially aimed at the most vulnerable population groups, in addition to strengthening public policies that expand access to early detection exams and ensure equity in cancer care (Sing et al, 2022).

Cervical cancer (CC) has a long natural history, characterized by slow development that offers several opportunities for intervention through primary and secondary prevention strategies. Primary prevention primarily involves vaccination against the human papillomavirus (HPV), while secondary prevention focuses on early detection of precursor lesions through cytopathological examinations and HPV testing, allowing intervention before progression to invasive stages of the disease (Pathah et al, 2022).

Recognizing the relevance of cervical cancer as a public health problem, the Pan American Health Organization (PAHO) developed and approved, in 2018, the Plan of Action for the Prevention and Control of Cervical Cancer 2018–2030. This plan proposes an integrated set of actions aimed at eliminating CC as a public health problem by 2030, including targets related to vaccination coverage, expansion of screening, timely treatment of precursor lesions, and ensuring equitable access to health services (WHO, 2022).

The implementation of this plan emphasizes the need for coordinated and continuous strategies that combine public health policies, health education, strengthening of the primary care system, and rigorous monitoring of coverage and effectiveness indicators. The prospect of eliminating CC reinforces the importance of sustainable investments in prevention and

control programs, as well as the articulation between governments, health institutions, and the community to achieve the internationally established goals (Vale et al, 2021).

In prospective estimates, it is estimated that the world will register approximately 121,000 new cases of cervical cancer (CC), which highlights the magnitude of this public health problem and reinforces the urgency of effective preventive and control actions. This scenario projects a growing need for intervention by health managers, who must implement integrated and sustainable strategies to reduce both the incidence and mortality associated with the disease (WHO, 2024).

Such strategies involve the combination of primary prevention policies, such as vaccination against the human papillomavirus (HPV), with secondary prevention actions, including the expansion of screening through cytopathological examinations and HPV tests, in addition to timely access to treatments for precursor lesions and diagnostic cases. In addition, the effectiveness of these actions depends on the articulation between different levels of the health system, continuous monitoring of epidemiological indicators, and the reduction of inequalities in access to health services, ensuring that the most vulnerable population groups are adequately covered (Oliveira et al, 2022).

Thus, the estimate of new cases reinforces the importance of planned public policies, consistent investments in prevention and control programs, and educational strategies aimed at raising awareness of the population about risk factors, the importance of early detection, and adherence to health recommendations, contributing significantly to the reduction of the CC incidence coefficient globally. When considering the regional distribution, it is observed that the regions with the highest human development indexes (HDI) concentrate approximately 70% of the total incidence of cancer in Brazil. However, the occurrence profile of different types of cancer varies significantly according to the level of socioeconomic development (Jardim et al, 2022).

In these more developed regions, cervical cancer (CC) occupies less expressive positions in the incidence ranking: it is the third most frequent type in the Central-West region (16.66 cases per 100 thousand women), the fourth in the South region (14.55 cases per 100 thousand) and the fifth in the Southeast (12.93 cases per 100 thousand). On the other hand, in regions with lower levels of development, such as the North (20.48 cases per 100,000) and the Northeast (17.59 cases per 100,000), the scenario is reversed: CC occupies a prominent position, being the second most common type of cancer among women. This disparity highlights the strong influence of social determinants of health and unequal access to prevention, diagnosis, and treatment services (Wirtz et al, 2022).

The data reinforce that, although Brazil has made significant advances in cervical cancer screening and control programs, regional inequalities persist. Regions with lower socioeconomic indicators still face structural challenges, such as lower coverage of Pap smears, geographical barriers, a shortage of trained professionals, and difficulties in the continuity of care. Thus, it is essential to strengthen public policies for equity in health, with a focus on expanding access to preventive services and reducing regional inequities, in order to promote a more balanced and effective response to the burden of CC in the country (Caminha et al, 2022).

On the other hand, the staging of cervical cancer (CC) is an important indicator of the quality of access and supply of health services made available by the State. The stage at which the disease is diagnosed directly reflects the effectiveness of public policies for prevention, screening, and early diagnosis, as well as the capacity of the care network to ensure coverage, equity, and continuity of care (Glehn et al, 2023).

Diagnoses made in the early stages generally indicate an efficient health system, with good coverage of Pap smears and easy access to primary care services. On the other hand, a high proportion of cases detected in advanced stages reveals structural weaknesses, such as deficiencies in screening, geographic and socioeconomic barriers, failures in timely referral, and limitations in the response capacity of specialized services (Meira et al, 2022).

Thus, the staging of cervical cancer goes beyond clinical data: it is an epidemiological and social marker that expresses regional inequalities and the effectiveness of public cancer control policies. Monitoring this indicator is essential to support the formulation of more precise intervention strategies, aimed at expanding access, strengthening primary care, and improving comprehensive women's health care, contributing to the reduction of morbidity and mortality rates associated with the disease (Ferrara et al, 2022).

Despite the high coverage of Pap smears, ranging from 66.5% to 76.8%, there is a worrying rate of diagnoses of cervical cancer (CC) in advanced stages, whose prevalence reaches approximately 46%. This paradox shows that expanding coverage, although fundamental, is not enough, by itself, to guarantee the effectiveness of screening and early detection of the disease. Several factors can contribute to this scenario, including the low quality of sample collection and analysis, failures in the periodicity of screening, difficulties in accessing follow-up of altered cases, as well as geographical, socioeconomic and cultural barriers that make it difficult for women to adhere to adequate follow-up. In addition, the absence of an effective and integrated monitoring system between the levels of care can compromise the referral and timely treatment of precursor lesions (Sing et al, 2022).

Although the coverage rates are expressive, the persistence of late diagnoses points to the need to reassess the effectiveness of the CC screening program. It is essential to strengthen the quality of actions developed in primary care, improve referral and counter-referral flows, and invest in professional training, as well as in health education strategies that promote greater awareness among the female population about the importance of prevention and periodic return to health services (Pathah et al, 2022).

There is a lack of studies that comprehensively describe the situation of cervical cancer (CC) in the national scenario, especially with regard to the identification and analysis of factors that contribute to the high rates of the disease in the country. This gap in scientific production limits an in-depth understanding of regional inequalities, structural failures in health services, and the influences of social determinants on the incidence and late diagnosis of CC (Madeiro et al, 2022).

The absence of systematic and up-to-date investigations on the subject makes it difficult to formulate more targeted and effective public policies, capable of responding to the specificities of each territory. Among the factors that possibly contribute to the high rates are unequal access to prevention and screening services, insufficient or ineffective coverage of early detection programs, unfavorable socioeconomic conditions, and the lack of educational strategies aimed at promoting women's health (Boon et al, 2022).

Thus, it is essential to encourage multicenter studies and regional epidemiological analyses that can provide robust evidence on the determinants of the persistence of CC in Brazil. Expanding the scientific knowledge base is essential to support public health decision-making, improve prevention and control strategies, and reduce, in an equitable and sustainable way, disease rates throughout the national territory (Caminha et al, 2022).

The understanding of cervical cancer (cervical cancer) can be significantly improved when analyzed from the perspective of social determinants of health. This approach allows us to recognize that the occurrence, diagnosis, and evolution of the disease are not explained only by biological or individual factors, but also by a set of social, economic, cultural, and environmental conditions that directly influence women's vulnerability and access to prevention and treatment services (Jardim et al, 2022).

Among these determinants, the level of education, family income, occupation, housing conditions, access to information and health services, as well as gender inequalities and geographical barriers that hinder the continuity of care, stand out. Such factors have a direct influence on the behavior of seeking preventive care, adherence to cytopathological screening, and the possibility of early diagnosis (Madeiro et al, 2022).

By considering the social determinants of health, it is possible to understand more broadly the context in which CC develops, favoring the development of more equitable and effective public policies. This perspective broadens the focus of care, integrating biomedical and social actions, and reinforces the need for intersectoral strategies that promote social justice, reduce inequities, and strengthen comprehensive women's health care (Caminha et al, 2022).

The Pan American Health Organization (PAHO), in line with the global strategy led by the World Health Organization (WHO), has proposed a set of ambitious goals for the elimination of cervical cancer (CC) as a public health problem by the year 2030. These goals make up the so-called "90-70-90" strategy, which establishes three fundamental axes of action aimed at prevention, early detection and effective treatment of the disease. The first goal refers to the vaccination coverage of at least 90% of girls up to 15 years of age against the human papillomavirus (HPV), the main etiological agent of CC. This measure aims to interrupt the chain of viral transmission and prevent the emergence of precursor lesions (WHO, 2024).

The second goal seeks to ensure that 70% of women undergo high-precision tests for HPV detection or cytopathological tests between 35 and 45 years of age, an age group considered to be at higher risk for developing the disease. This systematic screening strategy allows for the early identification and treatment of cervical changes, significantly reducing progression to invasive cancer (Wirtz et al, 2022).

Finally, the third goal proposes that 90% of women diagnosed with precancerous lesions receive adequate treatment, as well as 90% of invasive cancer cases be properly managed, ensuring comprehensive care, equitable access and continuous follow-up. The adoption and fulfillment of these goals represent a historic milestone in the fight against CC, reinforcing the global commitment to health equity and the reduction of regional inequities. To this end, it is essential to strengthen care networks, train professionals, invest in laboratory infrastructure, and expand educational campaigns that encourage adherence to prevention and screening strategies (Meira et al, 2022).

Considering the national scenario, Brazil presents intermediate values of incidence and mortality from cervical cancer (CC) when compared to the world scenario, reflecting hybrid characteristics of developed and developing countries. This situation highlights the coexistence of technological and structural advances in certain regions with persistent weaknesses in others, mainly related to unequal access to prevention, diagnosis, and treatment services (Oliveira et al, 2022).

According to estimates for the 2020–2022 triennium, an incidence of 15.4 new cases per 100 thousand women was projected, which places the country at an intermediate level of risk. However, there is marked regional heterogeneity: the highest incidence rates are recorded in the North and Central-West regions, with approximately 23.9 cases per 100 thousand women, while the lowest rates occur in the Southeast region, with about 11.3 cases per 100 thousand women (WHO, 2024).

These discrepancies clearly reflect the socioeconomic, demographic, and care inequalities that exist in the national territory. Differences in income, education, health infrastructure, and availability of screening and treatment programs directly influence the risk of illness and death from CC. In addition, such inequalities are manifested not only between the major regions of the country, but also between urban and rural areas, and even between intra-urban territories, where populations in situations of social vulnerability face greater barriers to access preventive health services. This scenario reinforces the need for integrated and territorially sensitive public policies, which consider the regional particularities and socioeconomic conditions of Brazilian women, aiming to reduce inequities and strengthen screening actions, early diagnosis, and timely treatment of cervical cancer (Glehn et al, 2023).

In another study, a coverage of 78.8% was observed in the performance of the Pap smear, an indicator that, at first glance, suggests a satisfactory performance of cervical cancer (CC) screening actions in the country. However, the authors point out that, even in the face of this high coverage, there is still a significant rate of diagnoses in advanced stages of the disease, which shows that expanding access, by itself, is not enough to guarantee the effectiveness of screening (Boon et al, 2022).

The study also emphasizes the influence of other predictors associated with late detection, such as the low quality of the samples collected, irregularity in the periodicity of the tests, failures in the follow-up of women with altered results, in addition to structural and social barriers, such as unequal access to health services, low education and the lack of knowledge about the importance of periodic screening (Pathah et al, 2022).

## **6 FINAL CONSIDERATIONS**

The present study highlights the challenging profile of coping with cervical cancer (CC) in the Brazilian context, revealing that, although there is a gradual trend of reduction in incidence and mortality, the disease still remains an important cause of morbidity and mortality among women, especially in regions marked by social inequalities and less access to health services.

The findings reinforce that the effective control of cervical cancer depends on an articulated set of strategies, ranging from the expansion of HPV vaccination coverage and the qualification of screening and early diagnosis actions, to the strengthening of the oncological care network and the confrontation of the social determinants of health. Thus, it is concluded that, despite the advances observed in recent decades, CC still represents a persistent challenge for the Unified Health System (SUS) and for public health as a whole, requiring integrated, continuous and equitable policies, capable of promoting not only the reduction of epidemiological indicators, but also the improvement of the quality of life of Brazilian women.

The present study has limitations inherent to the use of secondary data sources, since the analysis depends on the quality, completeness, and consistency of the information recorded in surveillance systems and institutional databases. In addition, relevant sociodemographic variables, such as age, marital status, and education level, which could offer a more comprehensive understanding of the factors associated with the incidence and detection of cervical cancer (CC), were not considered.

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